

THE FACTS

Information About
Environmental Cleanup
at McClellan AFB.

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Number 23

McClellan Tests Two-Phase Technology

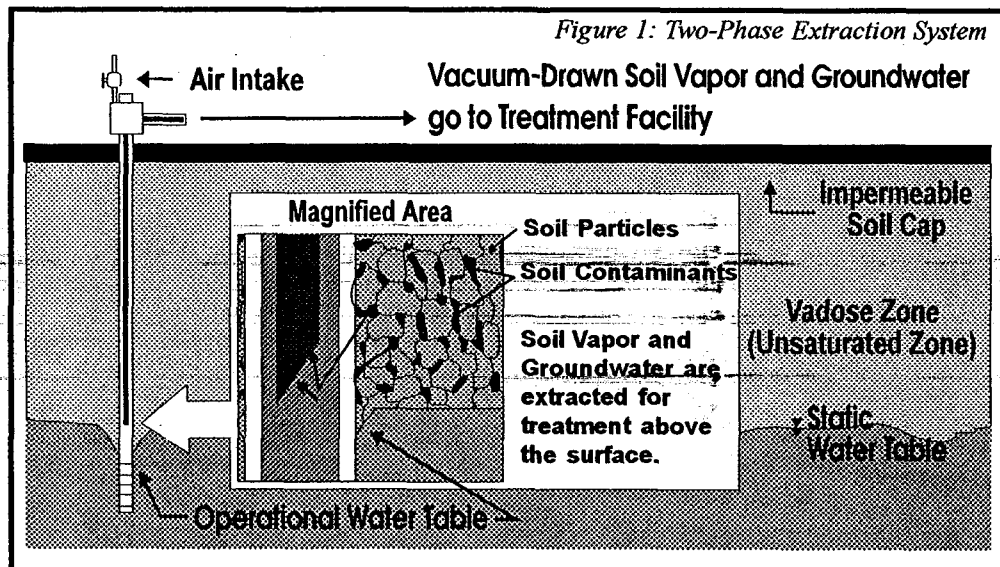
McClellan AFB is committed to looking for better ways to effectively cleanup contamination, thereby reducing costs and cleanup time. One way McClellan is looking to meet these goals is by testing new technologies. The testing allows McClellan to choose new cleanup methods that have proven to be more effective than existing cleanup technologies. One new technology, the Two-phase extraction system, is being tested at sites where contaminated soils have caused groundwater contamination. Preliminary results show Two-phase extraction has proven to be highly effective at removing contamination while preventing tainted groundwater from moving.

How Two-Phase Extraction Works

Two-phase extraction systems work by using a powerful vacuum pump at the groundwater surface. The pump pulls both soil vapor and groundwater out of the ground for treatment. It is similar to the action produced when you place a straw over the surface of a soda and draw it out. The groundwater (soda) mixes with soil vapor (air) and is removed for treatment. Two-phase systems are expected to replace or complement many existing groundwater extraction pump and treat systems.

Two phase extraction systems work by installing an extraction well into the groundwater. A tube is placed in the well going down into the groundwater zone. Within the tube, there is a one inch diameter straw. This straw goes down into the well and stops just above the water level (see figure 1). A powerful vacuum then draws the air/water mix back out, at the same time stripping soil vapor from between the soil particles and removing groundwater for above-surface treatment. The vacuum

draws most of the groundwater contaminants into the vapor stream and allows for more cost-effective treatment. At the surface, soil gases are separated from the water. The vapors are sent to a vapor treatment facility and the groundwater is sent to a groundwater treatment plant. Removing the groundwater creates a depression in the groundwater table and prevents contaminated



groundwater from moving. Two-phase combines the functions of two other technologies, Soil Vapor Extraction and Pump and Treat, for effective treatment and containment.

Soil Vapor Extraction (SVE), a treatment technology designed to treat soils contaminated with Volatile Organic Compounds (VOCs), has proven its cost effectiveness and is being widely implemented at McClellan (See *The Facts* #13 & #22).

Background on contamination removal systems in use at McClellan

SVE uses a vacuum to draw out the air from between soil particles. The fast-moving air literally strips the VOCs out of the soil. The contaminants are then destroyed in an emission control system, in a way similar to that used in an automobile's catalytic converter. The system has removed more quantities of VOCs in

the first few months of use than the groundwater treatment plant has since its installation in 1987. However, SVE systems cannot be used below the groundwater table.

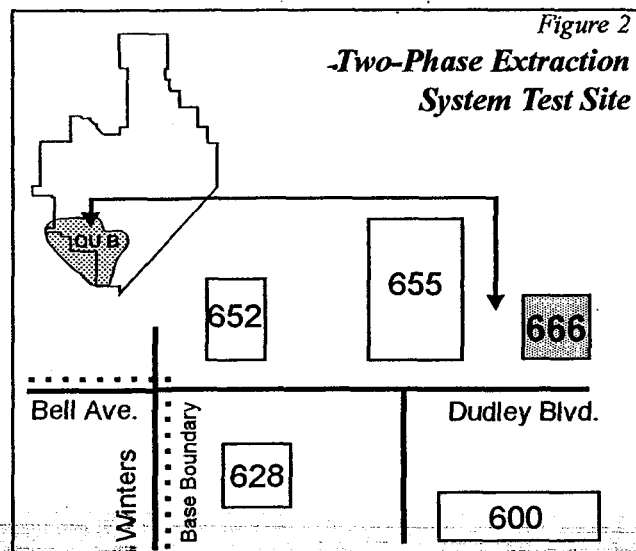
Pump and Treat technology is used to extract contaminated groundwater out of wells. The contaminated water is then treated at the Groundwater Treatment Plant on base. Pump and Treat systems serve a critical purpose by containing contaminated groundwater. However, as a treatment process, Pump and Treat is slow and expensive.

Two-phase technology incorporates the best qualities of SVE and traditional Pump and Treat methods

At McClellan, Two-phase technology has been tested near building 666 in Operable Unit (OU) B (see figure at right). Two groundwater extraction wells were converted to Two-phase extraction systems, and the initial testing demonstrated significant cost-effectiveness. After the extraction wells were converted, the cost of treating the contaminated groundwater was two to three times lower than using conventional Pump and Treat technology. This demonstrates that the Two-phase extraction system has substantial cost savings over the existing Pump and Treat system.

Installation of Two-phase extraction systems will be relatively easy, as existing extraction wells can be easily converted. Two-phase technology is effective in soil conditions with little air permeability, and with water tables that are below 100 feet. Most of McClellan's targeted sites match these soil characteristics, so the potential for widespread use of Two-phase extraction systems is great.

Long term testing is continuing on the two wells already converted. The system should enable McClellan to meet its goals of increasing the contaminant removal rate, containing groundwater on the base and removing sources of groundwater contamination. If successful, the widespread use of Two-phase extraction systems can be expected.



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